

**Hydraulics Report
NH-BR 1-2(113)113
Kalispell West
KCY
November 2011
CN 4773**



Introduction

This project is located in Flathead County on US Highway 2 where it crosses Ashley Creek at two locations. The existing bridges were built in 1933. The bridges are 41 feet long, 31 feet wide, have vertical abutments, 1 span and are skewed 45 degrees.

General

- The channel is very stable through this reach with no signs of eroding banks.
- There is very little debris through this reach due to Smith lake which is located about 2 miles upstream.
- The 2026 ADT is estimated at 9720 vehicles per day. The design flood is the 50-year flood, based on the design flood guidelines found in PM number 11-A.
- The reported USGS active channel width at the gage just upstream of the east bridge is 26 feet. This stream at this location is much wider than the average channel width.
- Hec-Ras version 4.1.0 was used to model the water surface profile.
- These sites are located on FIRM panel 300023 1800. A detailed floodplain study is not available.
- The elevations are NAVD88.
- Per Flathead County floodplain management requirements (January 2007) no minimum freeboard requirement is specified. (Section 5.02 B.2.)

Hydrology

The published USGS flows for the gage 12367500 just upstream from the east bridge were used. The flood insurance study used this gage and adjusted the predicted flows downstream using the USGS gage transfer method.

Hydrologic Method	Area Sq Mi	Q2 CFS	Q50 CFS	Q100 CFS	Q500 CFS
Gage 12367500 +	201	95	751	1010	1900
* FIS Flows	280	-	1050	1430	2210

*2007 Flood Plain Management Study

The flows published by the USGS should be used for design.
+ The flood of record was 749 cfs on May 27, 1948.

Hydraulics

The model was started 1479 feet downstream of the east bridge and continues upstream for 6456 feet to a point 363 feet upstream of the west bridge. A starting slope of 0.003 ft/ft was used from the surveyed thalweg elevations.

The Manning Roughness coefficients used were 0.035 for the main channel and 0.050 for the overbank areas. These values were based on field observations.

West Bridge

The bridge crossing is located in a reach where floods are confined to the channel section with very little floodplain. The bridge looks adequately sized with no evidence of scour. The low beam elevation is 3152.8.

The natural active channel width (vegetative line) near the West bridge varies from 18 feet to 28 feet.



West Bridge – Looking Downstream

Existing Bridge

Flood	Q	+W.S.	+WS	Backwater	Velocity
Event	CFS	Existing	Natural	Ft	ft/sec
2-yr	95	3146.86	3146.86	0.00	1.7
50-yr	751	3151.35	3151.30	0.05	4.7
100-yr	1010	3152.30	3152.22	0.08	5.6
500-yr	1900	3155.56	3154.50	1.06	9.2

Proposed 15 ft Bottom Width

Flood	Q	+W.S.	Backwater	Δ Backwater	Velocity
Event	CFS	Elev	ft	From Existing	ft/sec
2-yr	95	3146.86	0.00	0.00	1.7
50-yr	751	3151.33	0.03	-0.02	4.5
100-yr	1010	3152.26	0.04	-0.04	5.3
500-yr	1900	3154.89	0.39	-0.67	8.1

11 ft Bottom Width

Flood	Q	+W.S.	Backwater	Δ Backwater	Velocity
Event	CFS	Elev	ft	From Existing	ft/sec
2-yr	95	3146.89	0.03	0.03	1.9
50-yr	751	3151.40	0.10	0.05	4.9
100-yr	1010	3152.34	0.12	0.04	5.8
500-yr	1900	3155.20	0.70	-0.36	8.7

Per Bridge Layout 21 ft Bottom Width

Flood	Q	+W.S.	Backwater	Δ Backwater	Velocity
Event	CFS	Elev	Ft	From Existing	ft/sec
2-yr	95	3146.83	-0.03	-0.03	1.1
50-yr	751	3151.29	-0.01	-0.06	2.8
100-yr	1010	3152.21	-0.01	-0.09	3.2
500-yr	1900	3154.49	-0.01	-1.07	4.4

+ Measured at section 4685 (71' upstream from the existing centerline)

Recommendation

The recommended bridge opening is a 15 foot bottom width at elevation 3143.50 and 1.5:1 abutment slopes with a 45° skew. The assumed structure is single span bridge with a minimum low beam elevation at 3153.3. The proposed bridge will span the active channel width and provide a larger waterway opening than the existing bridge. The existing bridge has a low beam elevation of 3152.8. A profile of the existing and proposed 100-year water surface is presented below.

Update

The maximum skew recommended by bridge is 30°. Since the channel is skewed 49° the width increased to 21 feet at elevation 3143.5.

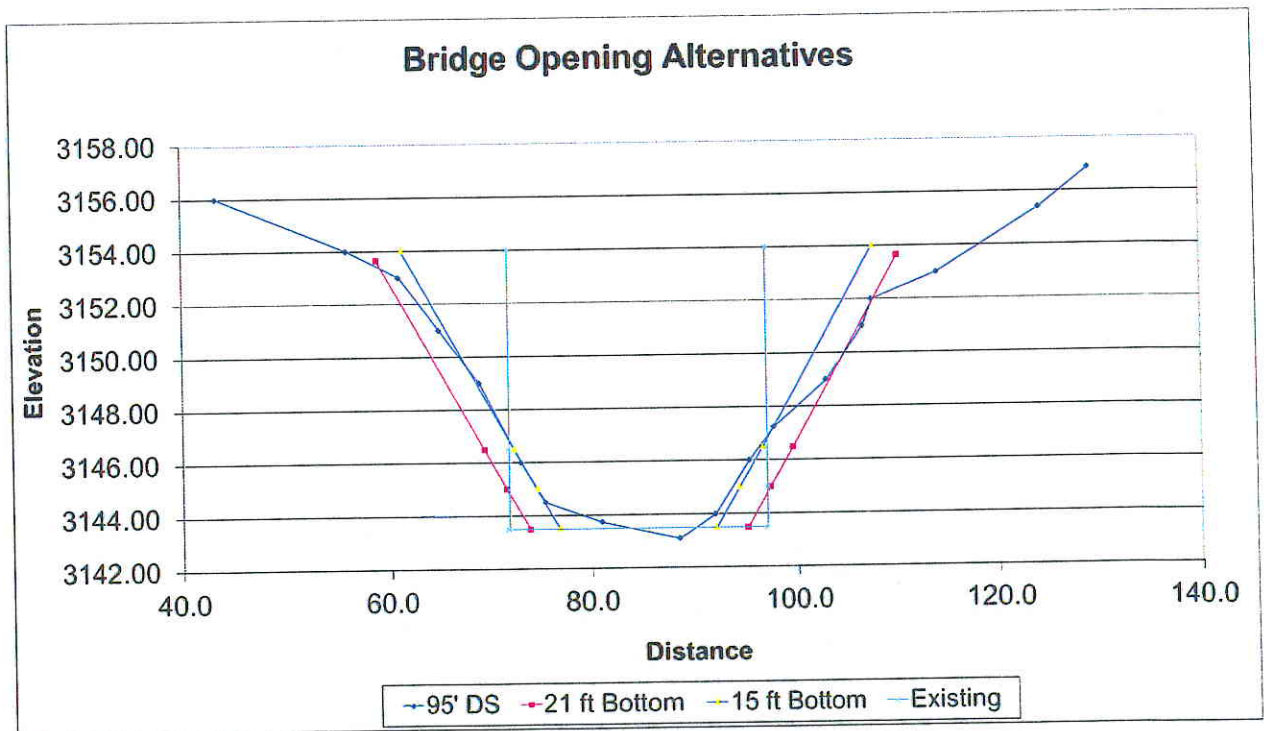
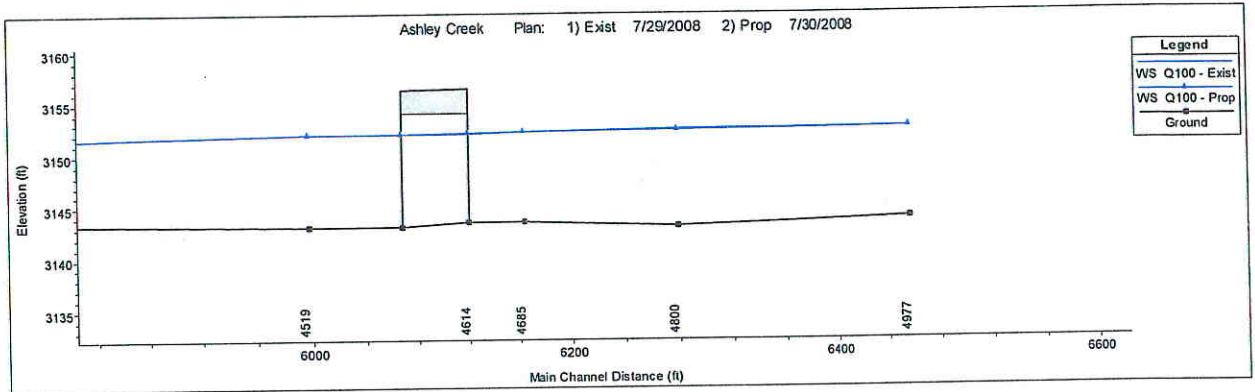
Scour

Flow Frequency	Contraction Scour (ft)	Pier Scour (ft)	Abutment Scour (ft)	
			Left	Right
500-yr	0.0	NA	0.0	0.0

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Riprap

Based on the riprap design procedure from Hec11, class I riprap is required to protect the abutments during a 500-year flood event.



East Bridge

It appears that rock has been placed under this bridge to pond water upstream. The low beam elevation is 3138.5. The natural active channel width (vegetative line) near the East bridge varies from 19 feet to 36 feet.